Open innovation and SPD

The pressure to innovate in the current business climate is exceptionally high[1]. Competitive advantage through incremental improvement alone is no longer possible and organisations must consider new and disruptive approaches to product development in order to enhance their market position[2]. By **Professor Dirk Schaefer*** and **Hannah L Forbes***

One approach that offers the opportunity for innovation in the current climate is social product development (SPD) which is defined as a "the use of social computing technologies, tools, and media, influencing the product life cycle at any stage"[3]. Since it is a term that describes several phenomena, a thorough understanding of SPD can only be gained from understanding each of its tenets and how they are united under this new approach. In this article, each tenet of SPD will be defined and their role within SPD will then be described. Guidance for the industrial application of these phenomena will then be provided. The key tenets of SPD are mass collaboration, crowdfunding, crowdsourcing, cloud-based design and manufacture (CBDM) and Open Innovation.

Mass Collaboration: A Form of SPD

Mass collaboration is defined as a "form of collective action that occurs when large numbers of people work independently on a single project, often modular in its nature"[3]. An example of mass collaboration is Wikipedia, where individuals use their own knowledge and expertise to contribute to a larger online encyclopaedia. The optimal result of mass collaboration is that the overall project is completed to a higher quality because individuals are able to focus on areas of the project where they can offer the most value.

Mass collaboration can itself be described as an approach or a "way of working". If mass collaboration is conducted, then it is integrated into all parts of the product development process and every phase of product development is conducted collaboratively. "Any endeavour where large amounts of people come together to solve a problem or contribute to product development would be deemed social product development"[3], therefore mass collaboration is a form of social product development. It should be understood, however, that not all social product development involves mass collaboration[9].

The application of mass collaboration in industry varies according to the project. There are, however, several principles of mass collaboration that promote effective application. These are as follows:

1) Accessibility: In order for all contributors to participate effectively, access to relevant aspects of the project must be arranged. For example, should the project

involve a centralised software system such as Wikipedia, all collaborators must have constant and easy access to the system.

2) Role and task definition: To ensure efficient collaboration, all contributors must understand their specific role, understand the tasks they need to complete and understand how their work interacts with the wider aims of the project.

3) Communication: As with all forms of collaboration, clear communication channels must be constructed and maintained. With the definition of the task and the roles, the dependent roles and tasks must also be defined. Each role should be able to clearly communicate with its dependent roles and vice versa.

When planning a mass collaboration project, these three principles should first be considered. Aspects of the individual project that influence how effective collaboration can take place, should then be considered.

The tools of SPD

Unlike mass collaboration, other tenets of SPD are not necessarily integrated throughout the entire product development process. Crowdfunding, crowdsourcing and cloud-based design and manufacture (CBDM) are applied as tools as part of SPD. As a consequence, the entire product development process does not need to be organised to include these tenets, they can instead be employed, when needed, during relevant design phases.

Crowdfunding is defined "as the process of taking a project or business, in need of investment, and asking a large group of people to supply this investment" [6]. Four models of crowdfunding exist and they each have various corresponding crowdfunding platforms. See **Table 1** below:

Crowdfunding is a tool that incorporates the power of the crowd to fuel the commercialisation process. Unlike traditional investment models, crowdfunding allows organisations to gauge customer interest, gather product feedback and entice early adopters, all before launching a product to market. It is a tenet of social product development because through launching a crowdfunding campaign, organisations can gain valuable insights for the improvement of their product's design.

Furthermore, by receiving funding, new methods for mass manufacture may be accessible, new materials may be accessible and phases of the product development process may be repeated.

Crowdsourcing is defined as "the act of taking a job, traditionally performed by a designated agent [. . .] and outsourcing it to a [. . .] large group of people" [11]. One of the most famous examples of crowdsourcing is Procter and Gamble's "Connect and Develop" which allows the organisation to "partner with the world's most innovative

Model	Definition	Example Platforms
Donation-based	Contributions are made with no expectation of any return	Just Giving, Go Fund Me
Lending-based	Peer-to-peer loans comprised of contributions from a large number of people	Rate Setter, The Funding Circle
Reward-based	Contributions are made in return for a gift or a product prototype	Kickstarter, Indiegogo, Crowdfunder UK
Equity-based	Contributions are made in return for a percentage stake in the business	Seedrs and Crowdcube

Table 1: The Four Models of Crowdfunding and Their Platforms

Crowdsourcing Initiative	Definition
Crowdsourcing contests	A contest designer poses challenge problems for the crowd. Judgement criteria and prizes available are clearly advertised E.g. Gold Corp
Open calls with direct rewards	Tasks in this class are broader. Judgement criteria not clearly advertised. E.g. Quirky
Open calls with indirect benefits	Contributors benefit indirectly from the company's implementation of the ideas in their products E.g. Connect & Develop by P&G
Micro-tasks or Human Intelligence Tasks (HITs)	Easy for humans to accomplish but difficult to automate. E.g. Amazon Mechanical Turk

Table 2: Crowdsourcing Initiatives

minds" by encouraging the crowd to submit product ideas and suggestions[5]. The different forms of crowdsourcing, or crowdsourcing initiatives, have been defined by Panchal[8] and are summarised in **Table 2**.

Crowdsourcing is most commonly used in the ideation and concept evaluation phases of the product development process. Its benefit lies in the ability to access a large number of individuals each with varying perspectives, backgrounds and cultures. As Howe[7] states "a randomly selected collection of problem solvers outperforms a collection of the best individual problem solvers". To apply crowdsourcing as part of a product development process, one of the initiatives outlined above should be selected based on various characteristics of the task at hand. **Fig. 1** illustrates this.

In social product development, crowdsourcing is the tool that allows an organisation to incorporate the power of the crowd during development. While crowdfunding, engages the crowd after detailed design, crowdsourcing can be used in requirements analysis, ideation and concept evaluation.

Crowdsourcing ensures diverse perspectives are drawn from throughout product development and works as a driver for innovation.

Cloud-based design and manufacture (CBDM) is "a service-oriented networked product development model in which service consumers are enabled to configure, select, and utilise customised product realisation resources and services ranging from computer-aided engineering (CAE) software to reconfigurable manufacturing systems"[12]. The term, therefore, summarises the online software available to support organisations throughout the product development process. **Fig. 2** shows some examples of CBDM services[12].

By using these cloud-based services, as opposed to local software, the product development process is more easily open for collaboration. Files can be stored and accessed worldwide from a centralised location, remote collaborators can work together in real-time and manufacturing processes can be initiated remotely. Overall, the product development process becomes more accessible and more efficient.

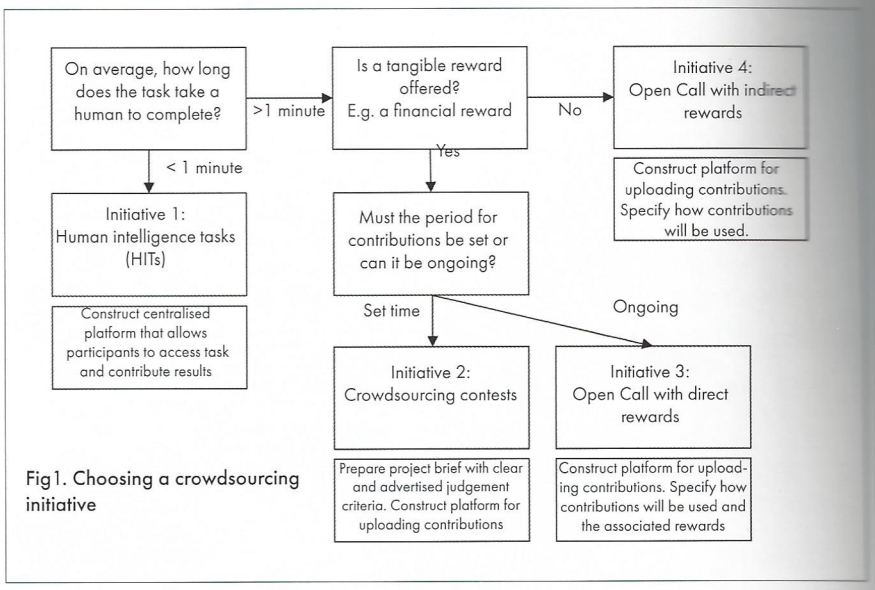

Fig 1. Choosing a crowdsourcing initiative

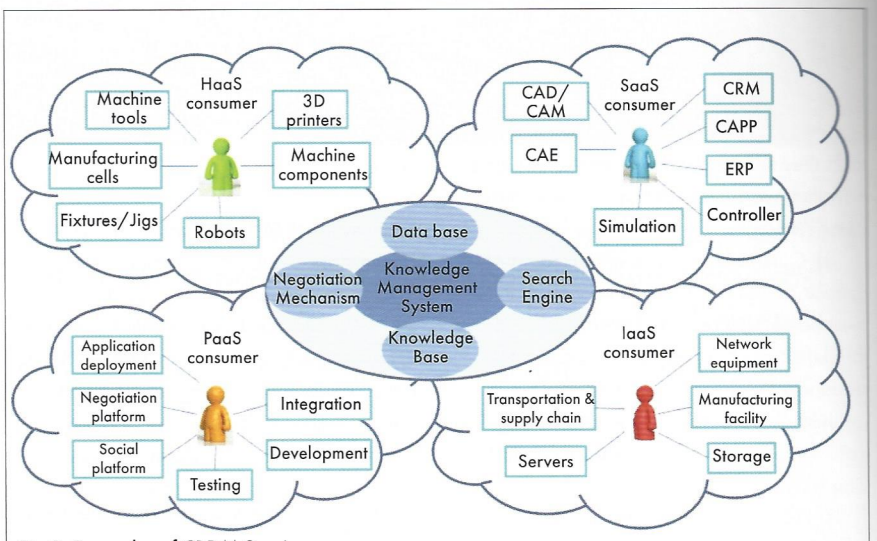

Fig 2. Examples of CBDM Services

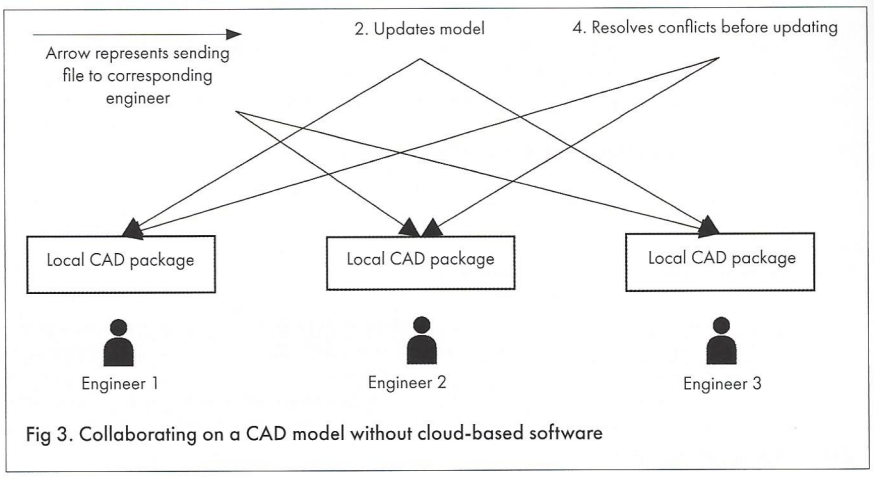

Fig 3. Collaborating on a CAD model without cloud-based software

CBDM is a tenet of SPD because effective collaboration relies on CBDM services. For example, should a group of geographically dislocated design engineers look to collaborate on a CAD model, without a cloud-based CAD service, the process would look like **Fig. 3**.

If a cloud-based CAD service is employed, the collaborative process would look like **Fig. 4**.

Fig. 4 illustrates a more effective form of collaboration and a streamlined process. Should an organisation look to involve geographically dislocated stakeholders in a collaborative process, CBDM services should be employed where possible throughout the product development process.

Open innovation

The next tenet of social product development is open innovation. Open innovation is defined by Trott et al.[10] as a term "used to promote an information age mindset towards innovation". This mindset encourages the sharing of data and knowledge with those external to the organisation. Understanding of the term is often promoted through comparison to the traditional mindset known as "closed innovation". For example, Chesbrough[4] states that "the open innovation paradigm can be understood as the antithesis of the traditional vertical integration model in which internal innovation activities lead to internally developed products and services that are then distributed by the firm". Open Innovation can be described, in relation to SPD, as an environment or climate that allows SPD to be fostered. For example, without adopting the mindset of open innovation, external collaborators could not be involved in mass collaboration. Furthermore, investment from crowdfunding could not be gained unless the organisation is willing to share their project with the external crowd.

When it comes to adopting open innovation in industry, Chesbrough[4] assists by describing the model of open innovation. He states that open innovation, beyond a mindset is, "the use of purposive inflows and outflows of knowledge to accelerate internal innovation and expand the markets fot external use of innovation". Focus must, therefore, be on creating these "purposive inflows and outflows of knowledge" to foster Open Innovation. A simplified example of the process of constructing these knowledge flows is shown in **Fig.5**.

In order to foster open innovation, an organisation must first replicate the mindset of open innovation and adopt a culture that appreciates the value of open data and shared knowledge. The organisation must then implement the model of open innovation by constructing the required knowledge flows.

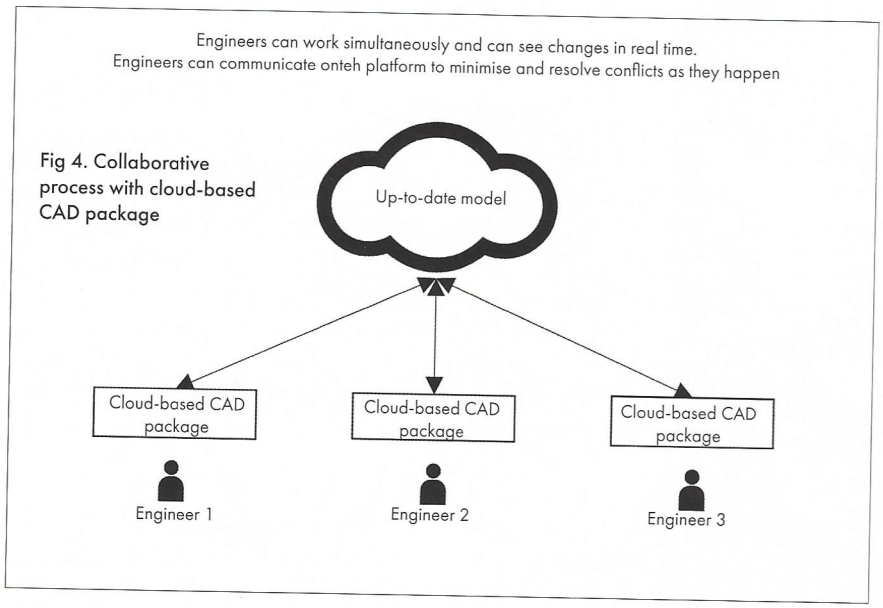

Fig 4. Collaborative process with cloud-based CAD package

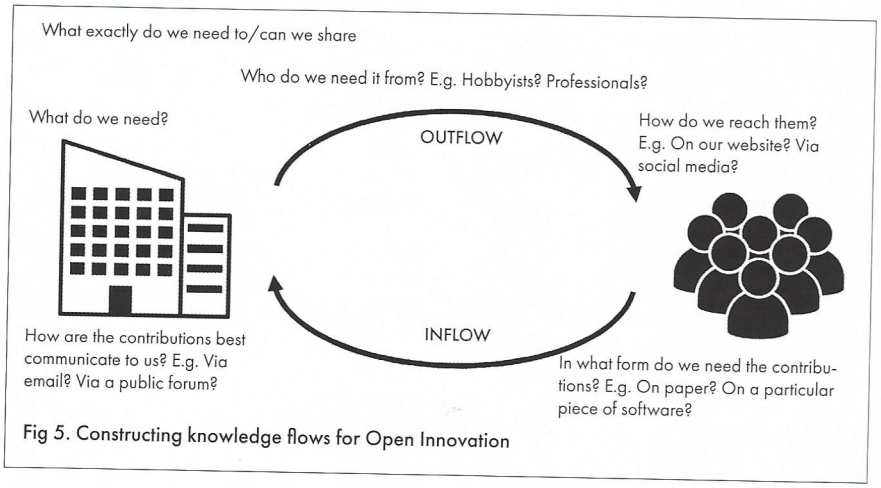

Fig 5. Constructing knowledge flows for Open Innovation

Conclusion

Having described each tenet, the overall concept of SPD can now be presented by recognising the commonalities between the tenets. Firstly, SPD encourages innovation by recognising the value of ensuring product development is accessible to the masses. Mass collaboration is an approach that allows individuals, regardless of location, to employ their expertise in product development. Crowdfunding and crowdsourcing ensure that the crowd, comprised of all backgrounds, are able to participate and gain from product development. Open innovation is a movement encouraging open access to knowledge. Through CBDM, manufacturing capability has been brought to the masses by making the processes more accessible through reduced cost and increased production flexibility. Additionally, SPD appreciates the value of employing the

crowd by tapping into the power of diversity and the power of numbers. Finally, each of these tenets are united by the idea that collaborative action, whether that be collaboration of the masses or collaboration of select individuals, results in better results for all. To apply social product development, organisations should aim first and foremost to adopt the open innovation culture. New projects should then be structured to allow mass collaboration and tools such as CBDM, crowdfunding and crowdsourcing to be incrementally employed. Organisations that complete this process will have the competitive advantage of obtaining innovative ideas, creating innovative products and then commercialising them in an innovative way.

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